Norwegian hospital nurses' satisfaction with the electronic patient record and associations with informational continuity during shift changes

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Abstract

Electronic patient records are of importance to health care providers to ensure informational continuity. Here, we present a cross-sectional study in which 5455 nurses from 35 Norwegian hospitals answered a questionnaire in relation to a study of how their work environment – including satisfaction with the electronic patient records system in use – impacted patient safety. The survey data was analysed to test whether satisfaction with the patient records system varied between different groups of nurses, and to assess the association between satisfaction with the electronic patient records system and the nurses' perception of informational continuity. We found group-wise differences that indicate that the electronic patient records systems could be improved, in addition to an association between satisfaction with the system and perceived informational continuity that confirms the role of electronic patient record systems in patient safety efforts.

Introduction

Hospitals are information intensive as well as highly specialized and fragmented organizations. The different units are characterized as separate in that the health care providers act in "enveloped" systems [1]. However, ensuring a continuity of care and well-functioning cooperation and communication over time and between units is an essential prerequisite for having health care of high quality [2]. According to Haggerty et al. [3], continuity of care is a multi-dimensional concept which exists in all health care settings: management, informational or relational continuity. Informational continuity is the transfer of information that links care providers aiming to deliver safe, connected and consistent health care to their patients.

Patient safety, regarded as one dimension of health-care quality, depends on well-developed structures and procedures for managing patient information and preventing errors [4,5]. Electronic patient records (EPR) systems has the potential to be a tool for health care providers to fill in possible communication gaps [6], ensure an accurate and appropriate information flow between providers [7], and therefore associated to patient safety aspects [8].

EPR's importance for bridging information gaps, thereby supporting patient safety, lies in the possibility to serve many users and readers independent of time and space, unlike the informal information exchanged and shared by personal handovers. Nurses play a pivotal role in coordinating care and ensuring patient safety [9]. However, poor communication is still reported as a critical feature in patient safety [10]. Stevenson et al. [9] found that nurses were primarily dissatisfied with EPRs for two reasons. The system did not support them in their everyday clinical practice, and they experienced that the system was not user-friendly. The Norwegian authorities emphasize that the use of an electronic exchange of information should be the standard communication mode in health care and that EPR is considered to be of the greatest importance in achieving this overall aim [6]. Over the past few decades, there has been a discussion in relation to what information should be transferred during nursing shifts and the best way to do it. However, few studies address the association between nurses' satisfaction with their EPR in use and their perceived informational continuity.

The use of EPR by various health care providers is influenced by how they perceive the feasibility and appropriateness of the systems in use [11]. Different groups of health care providers may have different opinions about the usefulness of EPR [12]. We applied the conceptualization for the informational continuity of care for framing this paper.

Our objectives were to study whether:

- Satisfaction with the electronic patient record system varied between different groups of nurses;

- Satisfaction with the electronic patient record system was associated with nurses' rating of information continuity during shift changes.

Methods

The data were collected in 2009 in a cross-sectional survey that was part of a large international study. The overall objective of the international study (RN4CAST nurse forecasting in Europe) was to investigate the impact of nurses' work environment on patient safety in hospital care (http://www.rn4cast.eu/ retrieved 12-29-2010). Based on the evidence on information systems at the national level in Norway, we chose to add questions to the survey questionnaire regarding nurses' satisfaction with the EPR system in use.

Setting and sample

The survey was conducted in Norwegian general hospitals and the setting included medical, surgical and intensive care departments. Thirty-two hospitals from 20 hospital trusts (out of a total of 22 in 2009) in all four health regions, in addition to three private non-commercial hospitals, took part.

All nurses working full- or part-time in these departments were included in the study. The units' nurse managers and nurses employed by external agencies were not included.

Instrument and data collection

The data collection instrument was printed and designed for self-administration. The questionnaires were distributed at the work place and returned individually in closed envelopes to the Norwegian Knowledge Centre for the Health Services.

In the present study, we used responses from three sections of the Norwegian version of the RN4CAST questionnaire:

1. Individual characteristics: Information about gender, age, tenure, education and department type.

2. Patient safety issues: One item from the Hospital Survey on Patient Safety Culture (HSOPSC) (http://www.ahrq.gov/qual/patientsafetyculture/hospsurvindex.htm retrieved 12-29-2010): "Important information about patient care is often lost during shift changes" (hence the name Perceived informational continuity), with a five-point response scale. The responses were coded with high values representing positive descriptions: Strongly disagree=5; Disagree=4; Neither=3; Agree=2; Strongly agree=1.

3. Satisfaction with the EPR in use: The End-User Computing Satisfaction Scale (EUCS) is a 12-item questionnaire (Doll, 1988) that was previously translated to Norwegian and validated in earlier studies exploring physicians' satisfaction with the EPR [13]. This version has also been used to assess the satisfaction of using EPR for nurses working in internal medicine at one Norwegian hospital[14]. EUCS calls for the respondents' rating of EPR appropriateness in regard to covering their needs, and has a five-point response scale that we coded as follows: Never/Almost never=1; Some of the time=2; Almost half of the time=3; Most of the time=4; Almost always/Always=5. EUCS has five subscales: Content (four items); Accuracy (two items); Format (two items); Ease of use (two items); and Timeliness (two items).

Analysis

The mean for each subscale in the EUCS was calculated and the average across the five means was used as a composite, continuous measure in the following analyses.

The five-point ordinal response scale of the HSOPSC item, Perceived informational continuity, was considered as a rough measure of a continuous characteristic in the population and used as a continuous dependent variable [15].

Students' *t*-tests and variance analyses were used to explore group differences in EUCS score means. A linear regression analysis was performed with Perceived informational continuity as a response variable. Explanatory variables in the regression model were EUCS scores together with individual characteristics, and the latter were successively removed from the model if deemed statistically non-significant. As the sample was obtained using

hospital-wise sampling, we performed the regression analyses in both ordinary and multi-level linear regression models.

Results

The total response rate was 57%. A total of 5455 nurses returned the questionnaire, providing an average of 156 responses per hospital (range 39–413). Table 1 shows descriptive information about the sample and measures used.

Table 1. Sample, scale and item descriptions.

Sample descriptions	Count	Percent			
Female	4926	90.3			
Employed Full-time	2615	47.9			
Has Special Education	1880	34.5			
Type of Unit: Intensive Care	1703	31.2			
Type of Unit: Surgical	1684	30.9			
Type of Unit: Internal Medicine	2068	37.9			
	Mean	Median			
Age (Years)	37.7	35			
Tenure as Nurse (Years)	11.1	8			
Tenure on Unit (Years)	6.8	4			
Scale and Item Descriptions			SD	Min	Max
EUCS Scale (Average of Five Subscales)	3.75	3.9	0.55	1	5
Perceived Informational Continuity (Single Item)	3.51	4.0	0.81	1	5

Female nurses were somewhat more satisfied with the EPR system than males, with a mean score 3.75 and 3.69, respectively (p=0.040). There was no statistically significant difference between nurses who worked full-time in comparison to those working part-time. Nurses with a specialty education were more critical in comparison to those without; their mean scores were 3.71 and 3.77, respectively (p<0.001). Nurses younger than the median age scored higher on the EUCS than those above the median age (3.78 and 3.72, p<0.001, respectively). Those who had worked longer than four years (median tenure on the ward) had a lower mean score (3.73) compared to those with a shorter tenure (3.77, p=0.008). Nurses who worked in surgical units were more satisfied (score 3.78) than those who worked in medical (score 3.74) or intensive care units (score 3.72) units (p=0.002). The respective results from the ordinary and multi-level regression models exhibited minor differences, with the former shown below (Table 2).

Table 2. The effect of End-User Computing Satisfaction scores and individual characteristics on Perceived Informational Continuity; OLS regression. Unstandardized coefficients.

	B	St.Error	p
Nurses in Intensive Care Unit	0.213	0.024	<0.001
End-User Computing Satisfaction	0.341	0.020	<0.001

Among the individual characteristics, only working in intensive care units was statistically significant. Adjusted R^2 was just below 7% in models with all relevant and known individual characteristics included, as well as in the final simple model. Working in intensive care units implied an increase in the Perceived informational continuity measure of 0.213 compared to nurses in medical and surgical units. For all respondents, one step upwards on the EUCS response scale was associated on average with an increase in the Perceived informational continuity measure of 0.341.

Discussion

Two main findings will be addressed. Firstly, the nurses' satisfaction with the EPR they use at their hospital. Secondly, we will discuss the association between EPR satisfaction and Perceived informational continuity.

Differences in satisfaction with the EPR

We found that male nurses were less satisfied with the EPR system than their female colleagues. Studies aiming to explore nurses' satisfaction with EPR have not addressed the gender differences [16, 17]. However, in a study exploring hospital nursing staff computer skills, males were more confident computer users than females [18]. The same study indicated that full-time staff members were more confident than part-timers, which is contrary to the present results. Our result may be a reflection of a non-existing difference or a consequence of the widespread practice that many nurses with a part-time employment contract work extra shifts, so in reality are full-time workers. Additionally, de Weer et al. [17] found an association between the amount of working hours per week and attitudes towards EPR .

Similarly to our results, a difference between older and younger nurses concerning EPR usage, was reported by Moody [19], who found that older nurses tended to hold a less positive attitude towards using EPR. Understanding these differences might be aided by the terms *digital natives* versus *being digitally ignorant*. Prensky [20] refers to persons who have been brought up with technology as having a different approach to applications, using digital tools and processing information differently from the digitally ignorant.

Associations between satisfaction with EPR and Perceived informational continuity

In general, the assumed importance of well-functioning EPRs in filling in communication gaps was supported by the positive association between EUCS scores and Perceived informational continuity among the nurses. The additional effect for nurses who worked in ICUs might be related to differences in care activities, access to additional clinical systems or as McFetridge et al. found that nurses in ICUs assess patient handovers as an integral process in caring [21].

In addition the more intensive and technologically advanced patient monitoring that takes place in these units probably also involves a stronger dependency on the systems that save and present detailed patient information.
We do not have information from the present study as to whether it is the EPR system alone, the combination of using EPRs and oral information during the shift change or unmeasured contextual factors that influenced the nurses' perception of the informational continuity of care. All of these factors should be taken into account since they possess an inherent potential for influencing patient safety [22]. Also, we have no evidence of which components in the EPR system were used during shift changes. Nonetheless, according to Chaboyer et al. [23], Australian nurses had the EPR system on hand during their handovers and used several available information components. The documented patient information is of significant importance in terms of information during a shift change because they contain much more information than simply relying on oral information [24].

The EUCS measures general features of the EPR system. Whether the EPR systems specifically provided features for improving the quality of handovers was not observed in our study. In a study from the UK, two-thirds of the nurses working in NHS Trusts reported having access to some decision support systems to help support them [25]. Furthermore, nurses have reported that that having an EPR exerted an impact on patient safety [17].

Some limitations should be mentioned. A response variable based on a scale, rather than the present single item would have improved the reliability of the Perceived informational continuity. The dispersion of the EUCS scores was low, thus possibly reducing the size of observed differences and associations. In addition, the association we observed may be inflated by a same source bias, e.g. yea-saying, although the importance of such a bias is uncertain [26].

The large and representative sample is a strength of the study, and justifies the assumption that the findings in our study are not limited to certain EPR systems.

Conclusion

Our study shows that the EPR systems in use in Norway can be improved. The viewpoints of various groups should be taken into account when courses are planned and existing systems are evaluated and developed to help avoid that only the opinions of the satisfied and highly competent are heard. Nurses who are satisfied with the EPR are more confident that important information about patient care is passed on during shift changes. A priority in future studies should be given to dimensions of informational continuity association to patient safety.

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